Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands	)	WT Docket No. 12-70
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	)	
Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz	)	ET Docket No. 10-142
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Service Rules for Advanced Wireless Services in the 1915-1920 MHz, 1995-2000 MHz, 2020-2025 MHz and 2175-2180 MHz Bands	)	WT Docket No. 04-356
	)	
	)	

COMMENTS OF ALCATEL-LUCENT

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Alcatel-Lucent submits these Comments in response to the above-captioned Notice of Proposed Rulemaking ("NPRM") seeking comment on its proposal to increase the supply of spectrum for mobile broadband by removing barriers to flexible use of spectrum currently assigned to the Mobile Satellite Service ("MSS") in the 2 GHz band.[1]

I. INTRODUCTION AND SUMMARY

Alcatel-Lucent is the trusted transformation partner of service providers, enterprises, and strategic industries worldwide, providing solutions to deliver voice, data and video communications services to end-users. A leader in fixed, mobile and converged

[1] *Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands; Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5- 1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz; Service Rules for Advanced Wireless Services in the 1915-1920 MHz, 1995-2000 MHz, 2020-2025 MHz and 2175-2180 MHz Bands*, Notice of Proposed Rulemaking, Notice of Inquiry, FCC 12-32, WT Docket No. 12-70, ET Docket No. 10-142, WT Docket No. 04-356 (rel. Mar. 21, 2012) ("NPRM").

broadband networking, IP and optics technologies, applications and services, Alcatel-Lucent leverages the unrivaled technical and scientific expertise of Bell Labs, a leading innovator in the communications industry. The following products represent some of Alcatel-Lucent's technological breakthroughs since 2010, alone:

- lightRadio™ – a groundbreaking antenna, capable of 2G, 3G, and 4G, small enough to fit in your hand, that promises to radically streamline and simplify mobile networks;
- 100G optical transmission – 100 Gigabit per second optical transmission and IP routing;
- DSL Phantom Mode – boosts the transmission speeds of copper DSL by 50%; and
- FP3 Processor – the world's first 400G network processor, which unlocks value for the next generation of online applications, entertainment and communications, while cutting power consumption by up to 50%.

Alcatel-Lucent has developed innovative satellite and hybrid satellite-terrestrial products, including for the S-band, both in the U.S. and abroad, maintaining expertise in the satellite field pioneered by Bell Labs with the earliest satellite systems.

With operations in more than 130 countries and the most experienced global services organization in the industry, Alcatel-Lucent is a local partner with a global reach. Alcatel-Lucent employs over 16,000 in the U.S., home to Bell Labs' global headquarters. Alcatel-Lucent's presence in the United States is central to its position as a world leader in emerging telecommunications technologies.

Alcatel-Lucent strongly supports the Commission's efforts to reallocate the 2 GHz MSS bands to permit terrestrial mobile broadband service, and agrees that granting terrestrial authority to the incumbent MSS licensee represents the most expeditious way to make 40 MHz of spectrum available for commercial broadband, a significant step to meet the goal of reallocating 500 MHz to terrestrial broadband services within 10 years. In the event a single

licensee holds all 40 MHz of the new AWS-4 band, as is proposed in the NPRM, the Commission should provide the licensee flexibility to treat the uplink and downlink spectrum blocks as seamless 20 MHz blocks to facilitate utilizing the channels in the band to respond to market forces and optimize operations.

These Comments demonstrate that, in a band plan that adopts the proposal to use the same uplink and downlink pairing for terrestrial service as the current MSS service in the band, interference into adjacent bands poses challenges, but is manageable. Alcatel-Lucent does not support shifting the AWS-4 uplink band up, as it is unclear that such a shift will have a meaningful, beneficial impact on interference into the adjacent PCS band and would render a portion of MSS uplink spectrum essentially unusable. Furthermore, with respect to interference into the federal bands above 2200 MHz, Alcatel-Lucent supports the proposed approach of measuring power flux density ("PFD") specifications at the protected site, to increase flexibility in the AWS-4 band while protecting federal operations.

Reasonable milestones are key to ensuring the new AWS-4 block is built out expeditiously. Alcatel-Lucent is concerned, however, that the proposed penalties, which feature automatic loss of license without any process, appear to be overly harsh and have the potential to disserve the public interest.

Beyond this proceeding, Alcatel-Lucent encourages the Commission to continue to make spectrum available for commercial broadband. Furthermore, Alcatel-Lucent urges the Commission to recognize a particular need for downlink spectrum, and – in the future – to consider band plans that account for the efficiencies of making available unpaired and asymmetrically paired downlink spectrum blocks.

II. THE COMMISSION SHOULD MOVE QUICKLY TO MAKE ADDITIONAL SPECTRUM AVAILABLE FOR MOBILE BROADBAND

There is great anticipation for how unleashing 40 MHz of MSS spectrum for commercial broadband use, as proposed in the NPRM, will fuel continued innovation and investment to benefit consumers and the Nation's economy. As the Commission recognizes in the NPRM, the United States is facing a critical need for more terrestrial broadband spectrum. It is for this reason that the National Broadband Plan, issued in early 2010, recommended that the Commission undertake to make 500 MHz of spectrum available for broadband over ten years, with 300 MHz available for mobile use within 5 years.[2] This need for spectrum continues to grow as more communications devices capable of supporting increasingly data-rich applications are used by consumers, enterprises, public safety agencies, and others. The use of new mobile multimedia services, connected device applications and machine-to-machine services is expected to continue to grow, as the new wireless Internet Protocol infrastructures being implemented today set the stage for innovation and expansion of the wireless ecosystem.

Furthermore, in this time of economic uncertainty, freeing up the 2 GHz MSS spectrum for mobile broadband is a critical ingredient to create jobs and enhance our global competitiveness. Chairman Genachowski recently praised the wireless industry as "innovators, investors and job creators," and recognized that, ". . . wireless has contributed to the creation of 1.6 million U.S. jobs in just the past few years. The mobile apps economy barely existed in early 2009. Today it alone supports nearly 500,000 jobs. Meanwhile, wireless contributes about $150

[2] Connecting America: The National Broadband Plan at 87-88 (2010) (*National Broadband Plan*), Recommendation 5.8 at 84-85, available at hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-296935A1.pdf.

billion annually to U.S. GDP -- and growing."[3] In this proceeding, the Commission has the opportunity to create jobs and spur investment in a particularly concrete way. By acting quickly to reallocate the band and by adhering to its proposals to grant terrestrial authority to the current 2 GHz MSS licensee with required build-out timelines, the Commission proposes the most expeditious path toward near-term investment in a new, nationwide terrestrial wireless broadband network. Simply put, this near-term investment means near-term jobs.

In sum, transitioning 40 MHz of 2 GHz spectrum for commercial broadband use would not only be a great start down the path toward 500 MHz of spectrum and meeting this Nation's spectrum needs, but a tangible, sorely needed boost to the U.S. economy.

III. THE CURRENT MSS LICENSEE IS BEST SITUATED TO EXPEDITIOUSLY DEPLOY TERRESTRIAL BROADBAND IN THE NEW AWS-4 BAND

Alcatel-Lucent agrees with the Commission's proposal to adopt the same uplink and downlink pairing designations for the provision of terrestrial service as presently exists for satellite service in this spectrum: 2000-2020 MHz uplink; 2180-2200 MHz downlink.[4] Alcatel-Lucent further agrees with the Commission's tentative conclusion that technical and policy considerations argue in favor of assigning the terrestrial licenses to the incumbent MSS licensee, rather than splitting the terrestrial licenses from the MSS licenses.[5] Consistent with these conclusions, Alcatel-Lucent supports the FCC's proposal to license the spectrum in two 10 MHz blocks, and also supports the Commission adopting a flexible paired single block option that, in

[3] Chairman Julius Genachowski, Prepared Remarks To International CTIA Wireless 2012, May 8, 2012.

[4] NPRM, ¶ 21.

[5] *Id.* ¶ 71.

the event a single licensee holds both the AWS-4 A and B Blocks, would allow that entity to combine them into one paired 20 MHz block to use flexibly and seamlessly.[6]

Adopting these recommendations would result in the fastest way forward to unlock 40 MHz of 2 GHz spectrum for terrestrial broadband use, and permit the combined MSS/terrestrial licensee optimal flexibility to use a 20 MHz block of spectrum in a way that will allow it to take best advantage of broadband technologies and business models. The Commission's conclusion in 2003 still holds true: "separately controlled MSS and terrestrial mobile operations (*i.e.*, two ubiquitous mobile services) in the same band would be 'impractical and ill-advised' because parties would not be able to overcome the technical hurdles to reach a workable sharing arrangement."[7]

Co-channel sharing between MSS and terrestrial operations presents technical challenges, even for a single entity. Without coordination, using such techniques as the Single Frequency Network ("SFN"),[8] there will be uncontrolled interference between terrestrial base stations and a co-channel satellite. Yet SFN requires careful dynamic synchronization of the terrestrial radios with the changing Doppler and time reference of satellites – even those that are nominally "geostationary." This coordination involves the station keeping maneuvers and regular tracking of the satellite ephemeris orbital parameters, literally as often as every 10 seconds. Otherwise, the terrestrial and satellite systems will cause interference with each other and will be required to shed a substantial number of users to reduce interference to acceptable

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[6] *Id.* ¶ 24.

[7] *Id.* ¶ 79 (quoting *Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L Band, and the 1.6/2.4 GHz Bands*, 18 FCC Rcd 1962, 1991 ¶ 49 (2003)).

[8] Wilkus, S.A., et al., "Field Measurements of a Hybrid DVB-SH Single Frequency Network With an Inclined Satellite Orbit," *IEEE Transactions on Broadcasting*, vol.56, no.4, pp.523-531, Dec. 2010.

levels. Dividing the frequency block for use by separate MSS and terrestrial licensees would restrict the data rates and capacity of each, far below what a coordinated system would support, greatly impinging on both MSS and terrestrial service capabilities.

Alcatel-Lucent further asserts that flexibility in the use of the licenses, within the limits of interference to other license holders, should be a guiding principal. The AWS-4 licensee should be permitted to respond to market forces by employing the most economical use of the band, whether this is a pair of 10 MHz LTE carriers, or a combination of satellite signals, broadcast standards, low-power small cells and conventional LTE macrocells. For example, if the license holder of the "lower A" block from 2000 to 2010 and the "lower B" block determines to combine those blocks into a single 20 MHz carrier or a 15 MHz and 5 MHz carrier, that ought to be permitted to facilitate the goals of improved spectrum utilization and as well as the flexibility principal.

The same holds true for the upper blocks (2180-2200 MHz). Whether the allocations should continue to be "ABBA" or should be changed to "ABAB"[9] ought to be the choice of the license holder to provide maximum flexibility. This flexibility can be particularly well utilized if a single entity holds the MSS and AWS-4 licenses.

This flexibility will also assist the AWS-4 licensee to best address any adjacent interference. The two outermost blocks of spectrum (2000-2010 and 2190-2200 MHz) are both most encumbered by interference concerns with the lower block having legacy PCS transmitters potentially adding adjacent channel leakage or Out Of Band Emissions ("OOBE") into the 2000-2020 MHz base station receiver, while the upper block downlink block (2180-2200 MHz)

[9] The notation introduced here, "ABBA" and "ABAB" refers to the NPRM at Figure 2, "Proposed AWS-4 Band Plan" where the pairing of the two licenses are indicated with the same letter "A" or "B."

requires a sharp cutoff filter to meet the stringent OOBE levels above 2200 MHz. The filter's rolloff in the 2190 to 2200 MHz block likely reduces the capacity of any carriers placed in this block. The common license holder may elect to combine both of these "outermost" blocks and use them somewhat differently than the less impacted innermost blocks. For example, the licensee might dedicate those blocks to indoor sites or may place satellite channels in the spectrum most encumbered by these neighbor issues if the licensee determines business and technical considerations indicate that is the most economical use for the spectrum.

Additionally, non-standard approaches ought to be permitted to allow, for example, shifting downlink carriers away from satellite signals or using different uplink and downlink channel sizes, at the discretion of the license holder, based upon field experience with interference sources and market demands for different services.

Constraining the duplex spacing and channel sizes restricts the license holder from using the spectrum in the most efficient manner. There are a multitude of approaches to allocating spectral resources among a variety of air interfaces from DVB-SH (a hybrid satellite/terrestrial broadcast technology), GMR (Satellite phone standard), EGAL (a more advanced satellite phone standard), LTE (terrestrial mobile phone system), e-MBMS (a broadcast/multicast capability of LTE-Advanced) as well as in-band signaling and calibration signals needed by the satellite, which are more varied than what is discussed in the NPRM. Any number, placement and bandwidths of these carriers could be placed throughout the band to maximize utilization of the various services.

It is presumptuous to suppose that the market demands for these services are static and predictable at the time of this rulemaking, just as it is presumptuous to imagine that there will be no further innovations that may use unexpected bandwidths and duplexing spacing. For

example, low-power and indoor small cells might be placed at the high end of the band where they pose little interference problem to the protected receivers in the 2200 to 2290 MHz band, while macrocells might best operate at the low-end of the band. Their bandwidths would be chosen to best accommodate the traffic demands of the coverage-providing macrocells and the capacity providing small cells. Yet this balance of traffic may change as the license holder evolves the network from an early deployment of one type of base station to another. As an additional benefit, such flexibility will reduce the potential for interference to (and from) adjacent bands.

For these reasons, Alcatel-Lucent recommends the greatest flexibility possible, limited only by the potential interference harm to adjacent license holders.

IV. INTEFERENCE FROM THE AWS-4 BAND INTO ADJACENT BANDS IS MANAGEABLE USING CURRENT AND EVOLVING TECHNOLOGIES

A. Potential Interference from the Proposed AWS-4 Uplink Band

In the NPRM, the Commission asks for comment on a proposal that AWS-4 terrestrial service rules will need to provide for the protection of spectrally proximate 2 GHz systems from harmful interference caused by AWS-4 systems.[10] Alcatel-Lucent has examined the various interference scenarios and believes that using the upper H block and the lower J block as guard bands are the best ways to mitigate interference to the incumbent users and interference from incumbent PCS base stations in the nearby frequency bands. Furthermore, these scenarios demonstrate that a 5 MHz or 10 MHz shift of the AWS-4 uplink band away from PCS downlink operations is not necessary and would serve only to add further uncertainty to the proposed reallocation of the band for terrestrial broadband.

[10] *See* NPRM, ¶ 29.

Alcatel-Lucent recognizes the potential for interference from AWS-4 user equipment ("UE") transmissions to incumbent PCS band UEs through the incumbent PCS UE receiver out-of-band blocking, although this interference can be reasonably managed. While concerns regarding interference are valid, especially with respect to certain legacy terminals that have limited blocking specifications, the terminals being made for the PCS A to G Blocks are being designed cognizant of the planned presence of adjacent broadband operations in the new AWS-4 band. Therefore, their RF front end filters are being designed accordingly. Moreover, while good engineering practice is to design against worst-case legacy specifications of interfering equipment, commercial wireless networks increasingly have many channels and alternative Modulation Coding Schemes as well as air interfaces and bands to use in combating problems seen in these limited cases (such as if a PCS-G block base station and AWS-4 base station were collocated).

As one example of a technical solution to mitigate worst case scenario interference with LTE, AWS-4 UEs may be commanded to transmit with Over-Provisioned Physical Uplink Control Channel ("OP-PUCCH") which moves control channels away from the band edge, reducing the leakage out of band. The use of Additional Maximum Power Reduction ("A-MPR") also manages interference to adjacent band UEs. There are many more examples, and too numerous to consider all such solutions here.[11]

With respect to potential interference from the AWS-4 band to the Broadcast Auxiliary Service ("BAS") band receivers in 2025-2110 MHz, such interference is easier to

[11] Interference *from* fixed PCS band base station transmissions can similarly be managed through filters and emission improvements, AWS-4 Rx base station filter/selectivity enhancement, and appropriate base station to base station antenna placement for isolation. Release 10 of the 3GPP specifications adds more stringent out of band emission limits for PCS-G block base stations

mitigate than interference into the PCS-G block, but benefits from some of the same tools, such as OP-PUCCH.[12]

While Alcatel-Lucent believes that interference is manageable under a scenario where the new AWS-4 Band mirrors the current MSS allocation, under that band plan, it does appear that the H Block and Lower J Block should be maintained as guard bands. Below, we review specific technical analyses requested in the NPRM.

Proposed emissions limits into the H Block. The NPRM seeks comments in Paragraphs 37 through 39 on emission levels into the H block that directly abuts the proposed AWS-4 band, and provides three different alternatives for OOBE limits.[13] The Commission proposes that transmitters in the AWS-4 band (1) maintain the existing linear interpolation; (2) attenuate emissions below 2000 MHz by $70+10*\log_{10}(P)$ dB; or (3) attenuate emissions below 2000 MHz by $43+10*\log_{10}(P)$ dB. Alcatel-Lucent believes that the third option is the only practical position that would permit handheld terminals to operate in the AWS-4 band. The other alternate proposals demand too sharp a filter to be practical in terminals using today's small form factor filter technology, a minimum of about 3 MHz transition band is the best that contemporary filters (F-BAR or SAW) can achieve while still fitting into handsets.[14]

(and after Dec. 31, 2012, all new PCS band base stations) for -30 dBm/MHz from 2000 to 2010 MHz and -49 dBm/MHz from 2010 to 2020 MHz.

[12] The out of band emissions from AWS-4 into bands below the PCS downlink bands, such as the PCS receive band, AWS-1 band, GPS bands and others already must contend with the PCS downlink operations, which are closer in proximity than the proposed AWS-4 band. These PCS downlink operations already present similar interference challenges to these other, further away bands, and the proposed AWS-4 band would not materially increase the interference potential into those bands.

[13] NPRM, ¶¶ 37-39.

[14] *See* Ex Parte Presentation by Agilent Technologies in WT Docket Nos. 04-356 and 02-353 Sept 15, 2005.

Proposed emissions limits between licensees within the AWS-4 band. Alcatel-Lucent similarly supports the proposal to harmonize the OOBE requirements to the common 43+10Log(P) level and associated measurement procedures to protect adjacent AWS-4 licensees within the band.[15] This level has worked well in nearly all other bands and is consistent with the 3GPP LTE standard for both terminals and base stations. While additional parameters may need to be considered to protect federal sites in the 2200 to 2290 MHz band (discussed below), this harmonized rule should apply to geographic areas outside the coordination regions.

The proposed alternative of shifting the AWS-4 Uplink band 5 or 10 MHz is unwarranted and not advised. Alcatel-Lucent is not aware of any FCC-certified products in the upper H Block (with an operating frequency from 1995 to 2000 MHz). As long as the 2000 to 2020 MHz block is for uplink service and the PCS band below 1995 MHz is for downlink, the H Block likely will not be well used, much like the 1915 to 1920 MHz block. These guard bands are just that, bands used to guard primary services with little capacity for TDD services.

New base station equipment can incorporate the larger RF filters that can provide the filtering needed to support a 5 MHz transition bandwidth such as would be provided at 1995-2000 MHz, with little loss in performance and with impacts to size, weight and costs that are not unduly burdensome. However, the legacy base stations that are already in the field were typically built with the 43+10Log(P) out of band suppression requirement, and are a substantial burden to upgrade. New or additional filters may not fit into older cabinets or may require entire Remote Radio Heads or transmit units to be exchanged. Existing PCS band base stations already in the field may or may not require additional filters or upgraded equipment to be compatible with AWS-4 base stations; their emissions vary by age, model, and loading conditions. Their

[15] NPRM, ¶ 33.

OOBE vary greatly depending upon the particular carriers deployed, and their intermodulation products.

Moreover, legacy base stations were designed to the 43+10Log(P) or -13dBm/MHz specification for OOBE,[16] and while they may often perform better than this level, the historical specifications were not particular about the level 5 or 10 MHz away from the band edge. As such, while a 5 or 10 MHz shift in the AWS-4 uplink band *may* sometimes be useful, the standard engineering practice of designing for the worst case would dictate that a 5 or 10 MHz shift would not ease the interference burden.[17]

A shift in the AWS-4 band would also make a portion of spectrum unusable for MSS operations. The existing satellites operating in the band likely have no provision for shifting their uplink by the proposed 5 or 10 MHz. If the Commission proceeds with this frequency shift, the satellite uplink would be reduced by nearly 5 or 10 MHz as the 20 MHz band slides out of the satellite's fixed band of operation. The MSS license holder would either have to suffer the 5 or 10 MHz "taken" from it or would need to replace the satellites to reclaim that spectrum.

For the foregoing reasons, Alcatel-Lucent recommends against shifting the AWS-4 band up 5 or 10 MHz.

[16] 47 C.F.R. § 24.238.

[17] One may be misled by testing a number of sites and seeing an advantage to shifting the band. However, the next site tested might show no advantage and would dictate that refurbishment of all sites, just in case they may later be a problem too, for example, when additional carriers are turned on.

B. Flexibility Should Be Provided for Measuring Emissions into the Federal Bands Above 2200 MHz

In the NPRM, the Commission seeks comment on potential interference of the AWS-4 downlink band into the Federal band from 2200-2290.[18] Interference from AWS-4 to the band above 2200 MHz is a manageable challenge due to the very sharp cutoff at 2200 MHz to an emission level of -100.6 dBW/4kHz. This would be managed with a high performance RF filter designed to provide sufficient rejection above 2200 MHz to insure compliance to this stringent emission level. This filter has some rolloff near the high end of the 2190 to 2200 MHz block, which results in some fraction of an LTE carrier to be filtered out. However, this is not expected to be any worse to the AWS-4 license holder than the signal loss from a common multipath fade and, in any event, is not a problem to existing adjacent band licensees.

The NPRM seeks comments on alternative proposals for the strict emission limit to protect users in the government bands.[19] Alcatel-Lucent asserts that the Commission should take a flexible approach that will optimize AWS-4 operations while protecting users in the adjacent band. Without a doubt, the RF filter needed to permit operations under this -100.6 dBW/4kHz rule is bulky, weighty and costs some performance of the AWS-4 license holder due to the roll-off within the band. If (i) the emission measurements above 2200 MHz could be prorated by measurement resolution bandwidth, as is done with the more typical 43+10Log(P) rules (for example, on the low side of the 2180 to 2200 MHz band), so that a transition to 2201 MHz were provided for, or (ii) the level were stepped down from -13dBm/MHz to -100.6dBm/4kHz within a small guard band, then the AWS-4 license holder would be much less burdened.

[18] NPRM, ¶¶ 47-55.

[19] *See id.* ¶¶ 53, 54.

The proposal described in Paragraph 54 of the NPRM for a sliding scale of emission levels based upon distance from the federal protected site[20] is commendable in spirit but is difficult to administer, and therefore not recommended. Base stations will be designed with -100.6 dBW/4kHz or 43+10*log(P) but not a variety of levels in between; the effort to design a different filter or radio for various distances would be excessive. Moreover, topography and morphology will have a great deal to do with the level of isolation between base station and protected site, not simply the two dimensional Euclidian distance. A site on a mountaintop is much more exposed than one on the distant side of hill, for example.

Alcatel-Lucent supports the approach described in Paragraph 53 for a PFD limit as an optional alternative to the EIRP limit to protect operations above 2200 MHz.[21] That alternative appropriately focuses on the actual amount of interference power present at the protected site. It can be very useful in general engineering of various band plans. A deployment of low power small cells using only the lower part of the 2180 to 2200 MHz block and mounted below the clutter or used indoors, for example, may be determined not to exceed a low PFD limit at a short distance from the protected sites. A license holder may very well be able to deploy such restricted base stations close to the protected sites without exceeding a PFD threshold, thus, without causing interference. Following such a plan with a reasonable target for the threshold PFD limit ought to be permitted as a safe harbor for compliance, even if the -100.6 dBW/4kHz limit might not be met. In this way, the Commission could facilitate deployment of robust service in the AWS-4 downlink band while safeguarding users in the adjacent government band.

[20] *Id.* ¶ 54.

[21] *Id.* ¶ 53.

V. REASONABLE MILESTONES SERVE THE PUBLIC INTEREST

A driving theme of these Comments advocates for the expeditious reallocation of spectrum for terrestrial broadband and the assignment of that spectrum to a licensee that will rapidly make use of that spectrum. It would be truly unfortunate if the Commission's considerable efforts result in the warehousing of spectrum. As such, Alcatel-Lucent strongly supports reasonable deployment milestones to ensure that the spectrum actually gets used in the near term. While Alcatel-Lucent does not comment here on what the specific milestones should be, a three year, interim milestone appears an important step toward this goal. Granting terrestrial authority to the current MSS licensee would further facilitate deployment – no other scenario would get the milestone clock ticking as quickly.

Similarly, reasonable penalties for failing to meet milestones also are important. There must be consequences if the milestones are to mean anything. However, the Commission's proposed milestones, which include automatic termination without Commission action,[22] are draconian and could strand 2 GHz satellite and AWS-4 terrestrial customers without service. Unlike in some contexts, where failure to meet construction milestones has meant a failure to commence service *at all*, that is not necessarily the case in the AWS-4 context. With respect to AWS-4 deployment, the licensee could successfully provide broadband service to tens of thousands of customers but still fail to meet the milestones. In that situation, it would not serve the public interest to suddenly cut those customers off. Alcatel-Lucent therefore believes that the proposed penalties, which include automatic loss of license without any procedural protections, should be reconsidered as potentially disserving the public interest.

[22] *Id.* ¶¶ 94-95.

VI. ALCATEL-LUCENT SUPPORTS MAKING ADDITIONAL DOWNLINK SPECTRUM AVAILABLE IN FUTURE PROCEEDINGS FOCUSED ON OTHER BANDS

Alcatel-Lucent applauds the Commission for its recognition that alternative band plans can substantially serve the public interest, and also that the review of new band concepts should not impede the timely implementation of the proposed AWS-4 service.[23] Although it is unclear whether implementing the "Extension Band Concept" would ever be feasible in the 2 GHz Band, the current NPRM is only one piece of the puzzle, with broadcast incentive auctions and various government bands among the spectrum set for near-term allocation for commercial broadband use.

Alcatel-Lucent urges the Commission to continue to consider band plans that include unpaired (and asymmetrically paired) downlink blocks, as a more efficient way to allocate spectrum and meet the comparatively greater need for downlink capacity. The average traffic payload in wireless networks appear to be increasingly "downlink heavy" by a factor of about 8 to 1. That is to say, about 85 to 90% of usable end-user bits are transmitted to the subscriber. Forecasts indicate that streaming video to subscribers will likely continue to be the leading growth application for smart phones. Thus, downlink traffic will continue to grow in importance, while uplink traffic grows less rapidly.

At the same time, uplink traffic is more amenable to advanced signal processing techniques such as CoOperative Multipoint ("CoMP") and Inter-Cell Interference Cancellation ("ICIC") and so uplink spectral efficiency has more known methods for improvement than does

[23] *Id.* ¶ 137.

downlink spectral efficiency. Both these consumer demand and technology factors suggest that it is more important to allocate downlink spectrum than uplink spectrum.[24]

The LTE-Advanced standard has incorporated features to allow for carrier aggregation across bands with asymmetry between uplink and downlink carriers in select bands. With these considerations in mind, the Commission's focus on unleashing more downlink spectrum than uplink is entirely consistent with emerging traffic trends and should be considered for all future band allocations.

VII. CONCLUSION

For the foregoing reasons, Alcatel-Lucent supports the Commission's conclusions in the NPRM to permit terrestrial broadband service in the current 2GHz MSS band and grant that terrestrial authority to the current MSS licensee with appropriate build-out milestones to ensure prompt use of the spectrum.

Respectfully submitted,

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[24] There are exceptions to these trends. For example, at this year's super bowl football game, there was more uplink traffic than downlink, as fans uploaded photos and videos of the event. Such venues are rare however, and require unique provisioning. "Super Bowl drives supersized wireless traffic," by Roger Cheng, February 7, 2012, available at http://news.cnet.com/8301-1035_3-57372694-94/super-bowl-drives-supersized-wireless-traffic/.